

WHAT IS CLAIMED IS:

*subcl* 1. A flip <sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device comprising:

a substrate;

group III nitride compound semiconductor layers formed on said substrate; and

a positive electrode including at least one layer of a first positive electrode layer which is formed on or above a p-type semiconductor layer and reflects light toward said substrate, said first positive electrode layer being made of at least one of silver (Ag), rhodium (Rh), ruthenium (Ru), platinum (Pt), palladium (Pd), and an alloy including at least one of these metals.

*subcl* 2. A flip <sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 1, wherein said positive electrode has a multi-layer structure made of a plural kinds of metals.

3. A flip <sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 1, further comprising a first thin-film metal layer, which is made of at least one of cobalt (Co), nickel (Ni), and an alloy including at least one of these metals, formed between said p-type semiconductor layer and said first positive electrode layer.

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4. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 2, further comprising a first thin-film metal layer, which is made of at least one of cobalt (Co), nickel (Ni), and an alloy including at least one of these metals, formed between said p-type semiconductor layer and said first positive electrode layer.

5. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 3, wherein a thickness of said first thin-film metal layer is in the range of 2 Å to 200 Å.

6. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 4, wherein a thickness of said first thin-film metal layer is in the range of 2 Å to 200 Å.

7. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 3, further comprising a second thin-film metal layer, which is made of at least one of gold (Au) and an alloy including gold (Au), formed between said first thin-film metal layer and said first positive electrode layer.

8. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim

4, further comprising a second thin-film metal layer, which is made of at least one of gold (Au) and an alloy including gold (Au), formed between said first thin-film metal layer and said first positive electrode layer.

9. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 7, wherein a thickness of said second thin-film metal layer is in the range of 10 Å to 500 Å.

10. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 8, wherein a thickness of said second thin-film metal layer is in the range of 10 Å to 500 Å.

11. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 1, wherein a thickness of said first positive electrode layer is in the range of 0.01 μm to 5 μm.

12. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 1, said positive electrode further comprising a second positive electrode layer, which is made of at least one of gold (Au) and an alloy including gold (Au), formed on said first positive electrode layer.

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13. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 12, wherein a thickness of said second positive electrode layer is in the range of 0.03  $\mu\text{m}$  to 5  $\mu\text{m}$ .

14. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 1, said positive electrode further comprising a third positive electrode layer, which is made of at least one of titanium (Ti), chromium (Cr), and an alloy including at least one of these metals, formed on said first positive electrode layer.

15. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 12, said positive electrode further comprising a third positive electrode layer, which is made of at least one of titanium (Ti), chromium (Cr), and an alloy including at least one of these metals, formed on said second positive electrode layer.

16. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 15, wherein a thickness of said third positive electrode layer is in the range of 3  $\text{\AA}$  to 1000  $\text{\AA}$ .

17. A flip<sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor

device comprising:

a substrate;

group III nitride compound semiconductor layers formed on said substrate; and

a positive electrode which is formed on or above a p-type semiconductor layer and reflects light toward said substrate, wherein said positive electrode has a three-layer structure comprising:

a first positive electrode layer which is made of at least one of rhodium (Rd), ruthenium (Ru), and an alloy including at least one of these metals;

a second positive electrode layer which is made of at least one of gold (Au) and an alloy including gold (Au), and formed directly on said first positive electrode layer; and

a third positive electrode layer which is made of at least one of titanium (Ti), chromium (Cr), and an alloy including at least one of these metals, formed directly on said second positive electrode layer.

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18. A flip<sub>A</sub> tip type of light-emitting semiconductor device using group III nitride compound according to claim 17, wherein thicknesses of said first, second, and third positive electrode layers are in the range of 0.02  $\mu\text{m}$  to 2  $\mu\text{m}$ , 0.05  $\mu\text{m}$  to 3  $\mu\text{m}$ , and 5  $\text{\AA}$  to 500  $\text{\AA}$ , respectively.

chip  
19. A flip<sub>A</sub> tip type of light-emitting semiconductor device using group III nitride compound according to claim

17, further comprising a first thin-film metal layer, which is made of at least one of cobalt (Co), nickel (Ni), and an alloy including at least one of these metals, formed between said p-type semiconductor layer and said first positive electrode layer.

20. A flip <sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 17, further comprising a second thin-film metal layer, which is made of at least one of gold (Au) and an alloy including gold (Au), formed between said first thin-film metal layer and said first positive electrode layer.

21. A flip <sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 17, wherein an insulated protective film which is made of one of silicon oxide ( $\text{SiO}_2$ ), silicon nitride ( $\text{Si}_3\text{N}_4$ ), titanium compound ( $\text{Ti}_x\text{N}_y$ , etc.) and polyamide, is formed directly on said third positive electrode layer.

22. A flip <sup>chip</sup><sub>tip</sub> type of light-emitting semiconductor device comprising:

- a substrate;
- group III nitride compound semiconductor layers formed on said substrate; and
- a positive electrode which is formed on or above a p-type semiconductor layer and reflects light toward said

substrate, wherein said positive electrode has a three-layer structure comprising:

a first positive electrode layer which is made at least one of rhodium (Rd), ruthenium (Ru), and an alloy including at least one of these metals;

a second positive electrode layer which is made of at least one of titanium (Ti), chromium (Cr), and an alloy including at least one of these metals, and formed directly on said first positive electrode layer; and

a third positive electrode layer which is made of at least one of gold (Au) and an alloy including gold (Au), formed directly on said second positive electrode layer.

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23. A flip<sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 22, wherein thicknesses of said first, second, and third positive electrode layers are in the range of 0.02  $\mu\text{m}$  to 2  $\mu\text{m}$ , 5 Å to 500 Å, and 0.05  $\mu\text{m}$  to 3  $\mu\text{m}$ , respectively.

chip  
24. A flip<sub>tip</sub> type of light-emitting semiconductor device using group III nitride compound according to claim 22, wherein an insulated protective film which is made of one of silicon oxide ( $\text{SiO}_2$ ), silicon nitride ( $\text{Si}_x\text{N}_y$ ), titanium compound ( $\text{Ti}_x\text{N}_y$ , etc.) and polyamide, is formed directly on said third positive electrode layer.

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25. A flip<sub>tip</sub> type of light-emitting semiconductor

device using group III nitride compound according to claim 22, further comprising a fourth positive electrode layer made of at least one of titanium (Ti), chromium (Cr), and an alloy including at least one of these metals, formed directly on said third positive electrode layer.

26. A flip <sup>chip</sup> ~~tip~~ type of light-emitting semiconductor device using group III nitride compound according to claim 25, wherein an insulated protective film which is made of one of silicon oxide ( $\text{SiO}_2$ ), silicon nitride ( $\text{Si}_x\text{N}_y$ ), titanium compound ( $\text{Ti}_x\text{N}_y$ , etc.) and polyamide, is formed directly on said fourth positive electrode layer.